

POSSIBILITY OF "CONSCIOUS" NATURE SCIENCE IN FIRST URBANIZATION

1. PRELIMINARY REMARKS

With this brief overview of the more significant technologies in the First Urbanization, we now pass on to the question of the possible emergence of the other nature sciences during the period. To begin with, however, we should like to draw the attention of the readers to one point in Gordon Childe's writings, whose lead we are trying basically to follow in our own understanding of the pre-historic period.

We have already seen that while discussing "exact and predictive sciences" ushered in by the Urban Revolution, he mentioned only arithmetic, geometry and astronomy, and not any other nature science, in spite of the spectacular progress in metallurgy and other techniques already on the eve of the full formation of the three primary centres of First Urbanization. Thus, we are inclined to understand that, in Childe's view at any rate, technology—though the most indispensable precondition for the making of science—does not by itself or smoothly pass on to "conscious" science. More factors are evidently needed for its making than are contained in the vast store of experience and knowledge acquired through mere technology. As he illustrates it with reference to metal technology¹ :

The sciences applied in metallurgy are more abstruse than those employed in agriculture and even pot-making. The chemical change effected by smelting is much more unexpected than that which transforms clay into pottery. The conversion of crystalline or powdery green or blue ores into tough red copper is a veritable transubstantiation. The change from the solid to the liquid state and back again, controlled in casting, is hardly less startling. The actual manipulations themselves are more intricate and exacting even than those involved in pot-making, spinning, or boat-building. . .

Metallurgical lore is the first approximation to international science. But it remains craft lore. All the practical science of the ancient smiths and miners was certainly embedded in an unpractical matrix of magic ritual. Assyrian texts, even in the First Millennium B.C., contain hints

1. Childe WHH 77-79.

of what such rituals may have involved—foetuses and virgins' blood. So do the remains of a bronze-workers' encampment in Heathery Burn Cave (Co. Durham) in England. Today barbarian smiths' operations are surrounded with a complex of magical precautions.

In the second place, the transmission of such lore by apprenticeship is largely imitative and therefore conservative...

Finally craft lore is liable to be secret. It is passed on from father to son or from master to apprentice. Craftsmen thus tend to form guilds or clans, which would guard jealously the mysteries of the craft.

2. ANCIENT TECHNIQUES AND MAGIC

Let us first try to be clear about one point. Early metallurgy, which of all the ancient techniques contained the greatest potentials for natural science, remained embedded in the matrix of magical beliefs and practices. So long as it was so, it remained more or less under the grip of superstitions, with its science-potentials crippled as jealously guarded secret craft-lore, disabling it to take the momentous step from pre-science to conscious science in the real sense. Why, then, was this matrix of magic?

It needs at once to be noted that the matrix of magic was not the characteristic of early metallurgy alone.* It constituted, on the contrary, the limitation of ancient techniques in general and was necessarily so. Thanks to the lucid analysis of George Thomson, we can understand that its need varies inversely with the development of actual technique: the less developed is the actual technique the more is the need of magic. As he explains :²

It (magic) is an illusory technique complementary to the deficiencies of the real technique. Owing to the low level of production the human consciousness is as yet imperfectly aware of the objectivity of the external world, which accordingly it treats as though it were changeable at will, and so the preliminary rite is regarded as the cause of success in the real task; but at the same time, as a guide to action, the ideology of magic embodies the valuable truth that the external world can in fact be changed by man's subjective attitude towards it. The huntsmen whose energies have been stimulated and organised by the mimetic dance are actually better huntsmen than they were before.

On the eve of the Urban Revolution, the metallurgists we are discussing were, of course, far more technologically ad-

vanced than the savage hunters. Hence is the normal expectation of them being free from the need of magic and moving towards an objective understanding of nature and natural processes, uninhibited by the limitations of magical fancies or superstitions. But such an emancipation from magic—and hence the move towards natural science—did not actually happen in history. There came into being other factors which, instead of emancipating people from superstitions, required its consolidation. Though apparently peculiar, such factors were included in the very preconditions for the Urban Revolution. This, as we shall see, is brilliantly described by Gordon Childe as “the dialectics of progress”—tremendous acceleration of man’s move forward carrying also on its heels forces of retardation.

3. CHANNELISING SOCIAL SURPLUS

Let us try to be clear about this point. In view of the immense complexities in the metallurgical technique, it could not but be a full-time job. The smiths and miners, because of their specialisation, could not at the same time be the direct producers of their own means of subsistence—tilling the fields and minding cattle. They had, therefore, to live on the surplus produced by others, though obviously in exchange of their own products. It is presumed mainly on the ethnological evidences, that in the period shortly before the Urban Revolution, they lived as itinerant craftsmen; as a single neolithic village could not, from its own surplus products, meet their requirements for the entire year, they had to move from village to village, exchanging their own products with the surplus food produced by each village and living on it for some period and then moved on to some other village with the same purpose.

An essential requirement of the Urban Revolution, however, was to have such full-time specialists settling permanently in the centres growing into cities, without which the requirements for the making of the cities could not be met. This means that the city-makers—or, more specifically, the organisers or rulers of the first centres developing into the cities—had to have at their disposal a somewhat vast amount of food-stuff for the annual maintenance of these specialist craftsmen. These governors, again, not being direct producers of food,

had to depend on the channelisation of the surplus products of the peasants from near and perhaps also comparatively distant villages to the city centres, so that these could be stored in the city granaries for the full-time specialists. The improved tools of production on the eve of the Urban Revolution enabled the peasants to create the social surplus, just as the improved means of transport must have helped this process of channelisation to the city-centres. Still the problem remained of how to obtain or extract from the direct producers their surplus products, so that these could be funneled to fill the city granaries.

There were three conceivable alternative techniques that could make this possible: (1) direct plunder, (2) purchase and (3) persuasion by ideological devices. We are going to see why the third of these presumably best suited the city governors and that moreover we have the clue in this to the factor that must have acted as the most powerful agent for inhibiting the emergence of natural sciences from the metallurgical and other techniques that were developed enough to contain in pronounced form the potentials for the making of natural sciences: the ideological devices that could best suit the procurement of the social surplus from the peasants went against the basic requirement of the emergence of nature science from the technologies fully pregnant with its possibility.

Let us begin with the three possible alternatives for procurement.

The possibility of purchase of the surplus products of the direct producers by the city governors—perhaps inclusive of merchants or traders—is ruled out, because the proposition of purchase would presuppose accumulation of sufficient wealth (or in the ancient context, the accumulation of city-products with which to barter with the peasants), and this, in its turn, already employing full-time specialists by the merchants and traders to produce the typical urban products of commodities with which to buy or barter with the peasants. This, in other words, implies the accumulation of food stuff in the city granaries already accomplished.

We are thus left with two other alternatives, namely plunder and persuasion. Of these two, again, plunder is a cumbersome and complicated process: it presupposes the maintenance of a bureaucracy with at least a sizeably large armed force to coerce

the peasants to part with their surplus products ; for their maintenance we have to presuppose again sufficient food stuff already accumulated in the city granaries. At any rate, compared to it, the method of persuasion is infinitely simpler and smoother. All that this method requires is the effective use of superstition. Thus, for example, once the peasants are made to believe that without offering a part of their products to the goddesses or gods—i.e. concretely to their earthly representatives, the priests or priestly corporations working for the god or god-king—they remain exposed to grave perils like draughts, plagues and disasters in many other forms, the peasants would willingly—and perhaps also eagerly—part with whatever they can afford from their own products. Besides, these priests or priestly corporations do not have to create such superstitions out of nothing : from the paleolithic age, people with extremely rudimentary understanding and control of nature were trying to supplement their real technique with the illusory technique, namely magic, from which the goddesses, gods and all sorts of supernatural agencies easily took shape. As George Thomson³ very lucidly explains :

The technique of magic is developed by the ruling class as a means of consolidating their privileges by investing them with supernatural sanctions. In this way the working class, being ignorant of the true causes of its subjection, is reconciled to its lot. This is the genesis of religion. Religion is an outgrowth of magic which emerges with the class struggle. It is an inverted image of social reality. Just as magic expresses primitive man's weakness in the face of nature, so religion expresses civilised man's weakness in the face of society.

This must have made the task of the governors of the early nucleus of cities all the simpler. They had only to systematise—to add awe and wonder—to a pre-existing system of beliefs and practices, and thus make the technique of persuading the direct producers to part with their surplus products to city rulers, from which to maintain the full-time specialists essential for the Urban Revolution.

But it will be wrong, of course, to take a merely negative view of the whole thing. The Urban Revolution was a momentous step forward in the history of mankind and the exploitation of the direct producers was a necessary precondition for

it, as was the use of superstition a precondition for this exploitation. We have, in other words, to understand the dialectics of progress which is summed up by Gordon Childe as follows :⁴

Almost from the outset of his career, it would seem, man used his distinctively human faculties not only to make substantial tools for use upon the real world, but also to imagine supernatural forces that he could employ upon it. He was, that is, simultaneously trying to understand, and so utilize, natural processes and peopling the real world with imaginary beings, conceived in his own image, that he hoped to coerce or cajole. He was building up science and superstition side by side.

The superstitions man devised and the fictitious entities he imagined were presumably necessary to make him feel at home in his environment and to make life bearable. Nevertheless the pursuit of the vain hopes and illusory short-cuts suggested by magic and religion repeatedly deterred man from the harder road to the control of Nature by understanding. Magic seemed easier than science, just as torture is less trouble than the collection of evidence.

Magic and religion constituted the scaffolding needed to support the rising structure of social organization and of science. Unhappily the scaffolding repeatedly cramped the execution of the design and impeded the progress of the permanent building. It even served to support a sham facade behind which the substantial structure was threatened with decay. The urban revolution, made possible by science, was exploited by superstition. The principal beneficiaries from the achievements of farmers and artisans were priests and kings. Magic rather than science was thereby enthroned and invested with the authority of temporal power.

It is as futile to deplore the superstitions of the past as it is to complain of the unsightly scaffolding essential to the erection of a lovely building. It is childish to ask why man did not progress straight from the squalor of a 'pre-class' society to the glories of a classless paradise, nowhere fully realised as yet. Perhaps the conflicts and contradictions above revealed, themselves constitute the dialectics of progress.

4. NATURE SCIENCE AND URBAN REVOLUTION

To sum up the points we have discussed so far : The priests or the priestly corporations—which, at least in Egypt and Mesopotamia formed the nucleus of the ruling class even while acting on behalf of the god or god-king, and which, as we shall presently see, presumably also did in the Indus Civilization—played, historically a role infested with an inner contradiction.

On the one hand they acted as the *organisers of production*. On the other hand they had also to act as the *administrators of superstition*.

Before passing on to discuss how, in spite of this inner contradiction in their role, they could create—or at least encourage the creation of—arithmetic, geometry and astronomy as exact sciences, we shall try to understand why, because of this inner contradiction in their role—specially as administrators of superstition—they were also obliged to prevent the making of nature sciences based on reason and uninhibited experience, and this in spite of the development of the technological prerequisites for their making, as, for example, in the case of metallurgy.

While the Urban Revolution resulted from the series of spectacular developments in technology preceding it, and, as a matter of fact, it resulted in spectacular achievements in many forms, the practical needs of its new socio-economic structure also required vigorous consolidation of the magico-religious beliefs without which the basic need of the city life—the channelisation of the surplus products of the peasants to the city centres from which to maintain the whole-time specialists—is not easily conceivable. As a result, the original functional role of the system of magico-religious beliefs passed into its opposite. In the earlier stages of social development, these were illusory techniques supplementing real techniques: though without directly changing or controlling nature these could and actually did change the subjective attitude of the technicians themselves—infuse in them hope, courage and confidence—and thereby help them actually to better control nature, though indirectly.⁵ In the hands of the city governors—the vigorous consolidation of the magico-religious beliefs, malignantly magnified, became the most effective instruments for controlling the people. In such circumstances, any attempt to understand nature and its laws depending on uninhibited reasoning and direct observation was sure to be frowned upon, if not actually prosecuted.

The question of mathematics and astronomy was, of course, different. The results of the former were too abstract to disturb the realm of the goddesses and gods and in any case it was necessary for the building of the gigantic ziggurats, temples and tombs of the god-kings, which, when built, could enhance

5. See G. Thomson SAGS I. 440.

the awe and grandeur of the priests and god-kings. Astronomy, besides having the obvious need for agricultural operations by way of preparing or regulating the calendar, had the added advantage of imputing supernatural knowledge and power to the priests and priestly corporations who incidentally, wanted to keep it a closely guarded secret : it enabled them to make the most wonderful predictions about the heavenly bodies as well as other predictable natural phenomena ; besides these heavenly bodies were viewed as veritable deities or at least as having some presiding deities, i.e. not as purely natural phenomena working according to just natural laws.

Thus the making of mathematics and astronomy in the primary centres of the Urban Revolution is not so difficult to understand. However what is also important to understand is the exclusion of the possibility of the making in these centres of other "conscious" sciences, aspiring to view nature as it is without any alien addition. This follows from the overriding need in these centres of another technique, which may be described as that of keeping the masses under control with fables and fears about the goddesses and gods—in short, the technique of using superstition. Nothing that disturbs this universe of superstitions could at all be tolerated. And hence there could be no scope in it for the making of nature science aspiring after an objective understanding of nature.

5. SUPERSTITION AND NATURE SCIENCE IN EGYPT : PLATO

The point we have been trying to make is not a new one. It was already noted by as sophisticated a philosopher as Plato many centuries back. We shall try to follow here George Thomson's⁶ analysis of the point.

It needs first of all to be noted that besides being a very eminent philosopher, Plato was keenly interested also in politics. His earlier work the *Republic* already shows this and his latest work the *Laws* is frankly a work on politics. Politically speaking, his main problem was how to keep the masses—the slaves—under control. From this point of view, he was repelled—indeed horrified—by the earlier Ionian nature philosophers, who were trying to understand nature in terms of

6. G. Thomson SAGS II (First Philosophers). Ch. XV.

nature itself ; from Plato's point of view, this had the most adverse effect for his political programme. Hence, in the *Laws*, he came out most sharply against the Ionian natural philosophers :

—They say that earth, air, fire and water all exist by nature or chance, not by art, and that by means of these wholly inanimate substances there have come into being the secondary bodies—the earth, sun, moon and stars. Set in motion by their individual properties and mutual affinities, such as hot and cold, wet and dry, hard and soft, and all the other combinations formed by necessity from the chance admixture of opposites—in this way heaven has been created and everything that is in it, together with all the animals and plants, and the seasons too are of the same origin—not by means of mind or God or art but, as I said, by nature and chance. Art arose after these and out of them, mortal in origin, producing certain toys which do not really partake of truth but consist of related images, such as those produced by painting, music and the accompanying arts, while the arts which do have some serious purpose, co-operate actively with nature, such as medicine, agriculture and gymnastics ; and so does politics too to some extent, but it is mostly art ; and so with legislation—it is entirely art, not nature, and its assumptions are not true.

—How do you mean ?

—The Gods, my friend, according to these people have no existence in nature but only in art, being a product of laws, which differ from place to place according to the conventions of the lawgivers ; and natural goodness is different from what is good by law ; and there is no such thing as natural justice ; they are constantly discussing it and changing it ; and, since it is a matter of art and law and not of nature, whatever changes they make in it from time to time are valid for the moment. This is what our young people hear from professional poets and private persons, who assert that might is right ; and the result is, they fall into sin, believing that the gods are not what the law bids them imagine them to be, and into civil strife, being induced to live according to nature, that is, by exercising actual dominion over others instead of living in legal subjection to them.

—What a dreadful story, and what an outrage to the public and private morals of the young !

What, then, was to be done ? How to counteract this “outrage to the public and private morals of the young” with a natural view of nature ? For Plato himself there was frankly only one answer to it and that was to feed the young with lies

and falsehood, which, though deliberately fabricated, was, from the standpoint of Plato's politics, naturally also "beneficial". Already in the *Republic*, Plato recommended it without mincing words. Thus :⁸

—And even if this were not true, as our argument has proved it to be, could a legislator, who was any good at all and prepared to tell the young a beneficial falsehood, have invented a falsehood more likely to persuade them of their own free will to do always what was right ?

—The truth is a fine thing and lasting ; yet it is not easy to make people believe it.

—Well, was it hard to make people believe the myth of Kadmos, and hundreds of others equally incredible ?

—Which do you mean ?

—The sowing of the dragon's teeth and the appearance of the warriors. What an instructive example that is to the legislator of his power to win the hearts of the young ! It shows that all he needs to do is to find out what belief is most beneficial to the state and then use all the resources at his command to ensure that throughout their lives, in speech, story and song, the people all sing to the same tune."

Still the question remained about the feasibility of such a programme. Was it at all feasible to feed the people with lies and falsehoods, so that they were left with no enthusiasm at all for natural philosophy or the tendency to know nature as it is ? In the *Laws*, Plato argued that it was surely feasible, as was evidenced by the achievements of the ruling class of ancient Egypt. Thus :⁹

—What are the legal provisions for such matters in Egypt ?

—Most remarkable. They recognised long ago the principle we are discussing, that the young must be habituated to the use of beautiful designs and melodies. They have established their norms and displayed them in the temples, and no artist is permitted in any of the arts to make any innovation or introduce any new forms in place of the traditional ones. You will find that the works of art produced there to-day are made in the same style, neither better nor worse, as those which were made ten thousand years ago—without any exaggeration, ten thousand years ago.

—Very remarkable.

—Rather, I should say, extremely politic and statesmanlike. You will find weaknesses there too, but what I have said about music

8. Quoted *Ibid* 324.

9. Quoted *Ibid* 324-25.

is true and important, because it shows that it is possible for a legislator to establish melodies based on natural truth with full confidence in the result. True, it can only be done by a god or a divine being. The Egyptians say that the ancient chants which they have preserved for so long were composed for them by Isis. Hence, I say, if only the right melodies can be discovered, there is no difficulty in establishing them by law, because the craving after novelty is not strong enough to corrupt the officially consecrated music. At any rate, it has not been corrupted in Egypt.

So that is what Plato thought. In the capacity of a politician interested in the safety of the slave society he realised that it was dangerous to allow the natural view of nature to be encouraged, that superstition—though philosophically and scientifically a *falsehood*—is *beneficial* for keeping the people under control and that the feasibility of using superstition as an instrument of policing the state was already proved in ancient Egypt.

Another senior contemporary of Plato, Isocrates, said practically the same thing about the political function of superstition in ancient Egypt. As Farrington observes : "A sophisticated Greek of the fourth century B.C. cast a glance at the official religion of Egypt and detected its social utility. The Egyptian lawgiver, he remarks, had established so many contemptible superstitions, first, 'because he thought it proper to accustom the masses to obeying any command that was given to them by their superiors', and second, 'because he judged that he could rely on those who displayed their piety to be equally law-abiding in every other particular'."¹⁰

In such an atmosphere, it needs hardly to be added, people with a naturalistic view of natural phenomena could hardly be encouraged or even tolerated. Hence, in ancient Egypt, apart from certain officially approved sciences like mathematics and astronomy, there was no scope for the development of any nature science, and this in spite of the spectacular developments in technology containing potentials for the emergence of nature science. "There is an official mythology, transmitted in priestly corporations and enshrined in elaborate ceremonial, telling how things came to be as they are. There are no individual thinkers offering a rational substitute for this doctrine over their

own names.”¹¹ In such circumstances the productive techniques continued to be handed down as craft-lore in the form of precepts and examples, and this among the members of the depressed classes, from whose actual experience and direct intercourse with nature it was too derogatory for the learned elites to learn anything and thereby to move to the actual knowledge of nature and its laws.

6. POSSIBLE ROLE OF SUPERSTITION IN INDUS ADMINISTRATION

Because of the concentration of political power among the priests and in the priestly corporations, what is discussed about Egypt was also true of Mesopotamia. But what about the third primary centre of the Urban Revolution, namely the Indus valley ?

By analogy, one is tempted to argue that since it was necessary for the other two primary centres of the Urban Revolution to use massive superstition for policing the state, the same must have been true also of the third primary centre. Besides, as we have already seen, the accumulation of the surplus products of the direct producers in the cities, seems to be best explained by the presumption of the use of superstition.

Nevertheless, the assumption of the vast Indus “Empire” being ruled by the priests or priestly corporations cannot be a smooth one and there is literally a storm of controversy over the question of the actual socio-political organization of Harappan culture. The main difficulty here, as about many other questions concerning the Harappan Culture, is the want of direct literary documents attesting to some view or other. It is generally admitted no doubt that there must have been some strong centralised power enforcing its authority over the Harappan “Empire”, because, without assuming it there is hardly any explanation of the manifold uniformity observed throughout it. But we have no direct knowledge of the nature of this centralised authority.

Many relics of the Indus Civilization are generally viewed no doubt as indicative of religion and religious beliefs.

From the time of the publication of the first full report on

the excavations of Harappa and Mohenjo-daro to that of the recent excavations at Kalibangan and Lothal, the archaeologists have shown how a large number of the relics of this forgotten civilization cannot but be understood as pointers to the powerful religious beliefs prevalent in the period. We need not try to prepare here a list of such relics ; readers interested in these may look up the recent book by the Allchins,¹² where most of these are very ably summed up. This does not mean, of course, that we have now a coherent and comprehensive understanding of the nature of Harappan religion and it is no use speculating on when and how any full account of it would be reconstructed. Nor is the basic fact to be ignored that among the eminent archaeologists controversies are still going on about its general outlines. However, all these do not materially affect our main argument, which requires only to be admitted that the Indus relics are unmistakably indicative of some presumably strong and widespread religious beliefs. If so, we have also to admit the custodians of these, namely the priests or priestly corporations, and, on the analogy of ancient Egypt and Mesopotamia, we are naturally tempted to assume that these priests and priestly corporations could remain quite aloof from the actual administration of the vast Indus "Empire". On the contrary, it would be logical to think that whatever might have been the actual nature of the social structure of the Indus Civilization, these priests or priestly corporations were only likely to have a large share—if not the decisive one—in the administrative machinery in the Harappan administration. From the remains of the imposing houses of the merchants in the Harappan cities, it is sometimes conjectured that these merchants could have formed the actual ruling class of the "Empire". But the obvious-difficulty about such a conjecture is that it can hardly explain the eventual internal decadence of the Harappan civilization, about which the archaeologists are agreed. The merchant class—sensing as they do greater and still greater profitability—are drawn to improving and augmenting the production-process and hence the government under their rule is only expected to prosper rather than become a prey to eventual degeneration and decay. By contrast, a government under the

priest class is only likely to be under the grip of strong conservatism and hence also exposed to the possibility of eventual decline and decay.

Incidentally, D. D. Kosambi has advanced a new suggestion indicative of the effective use of religious superstition as an effective instrument for Harappan administration. As he puts it :¹³

Finally, the tools of violence were curiously weak, though nothing is directly known of their social mechanism for wielding force, which we call the state. The weapons found in the Indus cities are flimsy, particularly the ribless leaf-blade copper spearheads which would have crumpled up at the first good thrust. There is nothing like a sword in the main Indus strata. Archers occur in the ideograms, arrowheads of stone and copper have been discovered. The bow would be a survival of the hunting age. Of course, iron was not known, so that a few weapons in the hands of a small minority might have sufficed; but the contrast with the excellent, sturdy though archaic, tools proves that the use of weapons was not very important. Therefore, the state mechanism, whatever it was, must have had some powerful adjunct that reduced the need for violence to a minimum. The cities rested upon trade, not fighting; but if the army or police were not very strong, what helped the trader maintain his unequal sharing of profit?

The answer seems to lie in religion. Though there are no great statues of the gods, what has been called the 'citadel' mound undoubtedly corresponds to the temple-zikkurat structures in Mesopotamia. The Harappan site has been devastated by brick-robbing, while at Mohenjo-Daro, what must have been the ruins of a major building in the sacred enclosure are covered by a Kusana stupa. But the adjacent 'Great Bath' at Mohenjo-Daro (filled with water drawn laboriously by hand from a special adjacent well, beautifully constructed with bitumen waterproofing between brick layers, a drain for emptying, and surrounded on three sides by cells) must have been a ritual tank, because of the beautiful and well-used bathrooms in every private house which distinguish the city from anything in proto-history, or Mesopotamia, or Egypt. Even a bather from the citadel could easily have descended the steps in the well which led down to the river. I have explained this as the prototype of the sacred lotus pond (*puskara*); which survived in later times.

Thus one of the main points stressed by Kosambi in favour of his view of the comparatively greater need of religious superstitions for policing the Harappan "Empire" is the flimsiness of the offensive weapons specially as contrasted with the ex-

13. D. D. Kosambi ISIH 59-60.

cellent, sturdy though archaic tools, which proves that the weapons usually needed to keep the people under control were not very important. To this may be added another point.

The weapons unearthed at the Harappan sites are indeed flimsy, indicating the lesser use of direct violence and hence comparatively greater use of religious superstitions. What could have perhaps made the argument stronger is another consideration.

Already in the introduction to the first full-length report on *Mohenjodaro and the Indus Civilization*, Marshall observes : "Their weapons of war and of the chase are the bow and arrow, spear, axe, dagger and mace. The sword they have not yet evolved : *nor is there any evidence of defensive body armours.*"¹⁴ We have added emphasis on the last point, because, thanks to Needham's brilliant analysis, this seems to have very decisive importance for the point Kosambi has argued in favour of the relatively greater use of religious superstitions for the Harappan rulers. The offensive weapons mentioned by Marshall,—spear, axe, dagger and mace—are useful in hand-to-hand fight, or in cases of immediate confrontation of armed force with the exploited peasants when necessary. Besides these were flimsy after all. But not so are the bow and arrow, which are very effective long distance missiles. Now, as Kosambi admits, the bow and arrow are inherited from the hunting stage, there is nothing to prevent the assumption that the peasants were as much equipped with these as were the armed forces of the ruling class. And it is here that the *defensive body armour* has supreme importance from the viewpoint of military technology in the distant past. So long, therefore, the defensive body armour is not developed and used, some method other than direct violence is needed to keep the masses under control.

In the Chinese context, as Needham shows, the lack or inadequate development of defensive body armours, was one main reason for the ruling class patronising the Confucian views, preaching to the people to remain submissive to the lords. As he puts it :¹⁵

What was the situation, then, in ancient China ? There the cross-bow—a most powerful weapon—was invented centuries before any-

14. Marshall MIC I. Preface p. iv. Emphasis added.

15. J. Needham GT 168-9. Emphasis added.

where else. We know that the men of the feudal levies in ancient China (by that I mean between 800 and 300 B.C.) were armed with powerful bows. But at the same time protective armour was very little developed. The archaeologist Laufer has written a fine monograph on Chinese armour. It arises very late, and in early times you only get protective clothing made of bamboo and wood. Moreover, there are in the *Tso Chuan* countless stories of feudal lords being killed by arrow shots. *If the mass of the people as a whole were in possession of a powerful offensive weapon, and the ruling class were not in possession of a superior defensive means, one can see that the balance of power in society was different from what it was in, e.g., the time of the early Roman Empire, where the disciplined legions were rather well armoured, with bronze and iron. A slave population was possible because it was not in possession of the arms and armour of the legionaries, nor did it have access to powerful bows. The principal Roman weapons were always the spear and the short sword. We know what troubles the slaves could give on the few occasions in which they did gain access to substantial stores of weapons, as in the revolt of Spartacus. In China, it was a different story, because from an early date the people had crossbows and the lords had poor defensive armour. If that was the case, it seems that the people in China had to be persuaded, rather than cowed by force of arms, and hence the importance of the Confucians.*

For, as Needham had already shown, "During what may be called the high feudal period in China, which runs roughly from the eighth century to the third century B.C. the feudal lords were assisted and counselled by a group of men who afterwards became the school of philosophers which we know as the Confucian School."¹⁶

With these points in mind, we may now return to the question of the Indus Civilization...

Not that we know of there having been any philosopher in the Harappan culture, not to speak of any school of philosophy even remotely resembling the Confucian one. Notwithstanding Marshall's expectation to the contrary,¹⁷ it can perhaps be safely asserted that there was nothing like that, or at least, even if there was any philosopher in the Harappan culture, we shall never know anything about him. What we do know, however, is that the *Harappans did not develop any defensive body ar-*

16. *Ibid* 155-56.

17. Marshall MIC I. 78.

mour. Even imagining that they developed something like that made of flimsy materials, these could be no good against the long-distance missiles—the bow and arrows—possessed in common by the army and the masses. It follows, therefore, that for keeping the masses under control it was essential for the ruling class to have something more than their military technology. This additional something had to have the efficacy of persuading the masses to remain as pious law-abiding citizens. In other words, in default of effective defensive armour they had to depend on ideological devices—or, to put it more bluntly, on religious superstitions on a really massive scale. Many stray objects found in the Harappan regions give us some glimpse of a rather imposing religion, though our archaeologists are yet to reconstruct any agreed view of this religion. But religion was there and so also there must have been its main accessory, namely, superstitions.

Could it, then, be that this religious ideology was the main instrument in Harappan culture for the purpose of policing the state? This brings us back to Kosambi's hypothesis though from a different premise altogether. What Kosambi argued from the flimsiness of offensive weapons seems to be strengthened by the lack of defensive body armour.

7. CONSCIOUS NATURE SCIENCE IN HARAPPAN CULTURE ?

With these clarifications, we may now return to the main point we wanted to discuss. On circumstantial evidences we have been led to presume the making of "conscious" sciences in two forms—namely mathematics and astronomy—during the period of our First Urbanization. But the First Urbanization also witnessed spectacular achievements in many forms, of which specially metallurgy did contain the potentials for the making of several natural sciences. Nevertheless the question remains, could "conscious" natural sciences develop from these technologies? In default of any documentary data, we are obliged to try to answer this question on the basis of circumstantial evidences only. Two of such evidences are crucial for our present purpose. First, metallurgy in the ancient world, with all the spectacular potentials for the emergence of natural sciences, remains embedded in an essentially ascientific matrix of magic and rituals. Secondly, the consolidation of such myths and

rituals leads to the formation of religious superstitions, and religious superstition is an effective factor contributing to the Urban Revolution itself, inasmuch as the channelisation of social surplus is necessary for the support of full-time specialists in the growing cities and religious superstitions best suit the purpose of persuading the direct producers to part with their surplus products. We have also seen that religious superstition could very possibly be the most effective instrument for policing the vast Indus "Empire". Our question, therefore is : Under such circumstances, could conscious nature science possibly emerge from their potentials implicit in the spectacular technologies witnessed by the Harappan culture ?

The answer to this is evidently in the negative. The basic precondition for the formation of "conscious" nature science is to understand nature and the natural changes as these actually or objectively are, i.e. without the veil of magical beliefs on these and, of course, without imagining any supernatural agencies—the goddesses and gods—controlling or interfering with these. In short, it is the emancipation from magic and also from the negative aspect of magic taking the shape of organised religion. However, such organised religion was in all presumption a very effective instrument for Harappan administration. This could not allow the spirit of understanding nature and natural phenomena on the basis of uninhibited observation and reasoning, i.e. the very precondition for the making of conscious science. We are thus inclined to conclude that "conscious" science only in two forms, viz. mathematics and astronomy, could develop in our First Urbanization, as in the two other primary centres of the Urban Revolution. But the Urban Revolution also required an intellectual climate that precluded the possibility of developing conscious natural science from the series of spectacular technological innovations. For making of "conscious" natural science in its true sense, Indian history had to await the advent of the Second Urbanization which was no longer under the grip of priestly administration. But more of this later.